

CLAIMS

What is claimed is:

1. A method for determining a fan speed for at least one fan used to cool a payload,
comprising:
 - receiving a first signal indicative of a first fan speed;
 - receiving a second signal indicative of a system temperature;
 - selecting a temperature setpoint based on the first fan speed; and
 - computing a first fan speed output based on a comparison of the system temperature and the selected temperature setpoint.
2. The method of claim 1, wherein selecting the temperature setpoint based on the first fan speed includes selecting the temperature setpoint using a predetermined speed-setpoint droop characteristic.
3. The method of claim 2, further comprising determining the speed-setpoint droop characteristic.
4. The method of claim 3, wherein determining the speed-setpoint droop characteristic includes:
 - selecting a range of ambient temperature operation;
 - defining an ideal speed-temperature characteristic for the selected range of ambient temperature operation;
 - determining a first approximation of the speed-setpoint droop characteristic;

comparing a speed-temperature characteristic associated with the speed-setpoint droop characteristic to the ideal speed-temperature characteristic; and

iteratively adjusting the speed-temperature characteristic associated with the speed-setpoint characteristic by adjusting the speed-setpoint characteristic such that the speed-temperature characteristic approximates the defined ideal speed-temperature characteristic.

5. A method for determining a speed-setpoint droop characteristic comprising:

selecting a range of ambient temperature operation;

defining an ideal speed-temperature characteristic for the selected range of ambient temperature operation;

determining a first approximation of the speed-setpoint droop characteristic;

comparing a speed-temperature characteristic associated with the speed-setpoint droop characteristic to the ideal speed-temperature characteristic; and

iteratively adjusting the speed-temperature characteristic associated with the speed-setpoint characteristic by adjusting the speed-setpoint characteristic such that the speed-temperature characteristic approximates the defined ideal speed-temperature characteristic.

6. A thermal management system comprising:

a temperature sensor;

at least one fan; and

a microcontroller in communication with the temperature sensor and the at least one fan,

wherein the microcontroller is for:

receiving a first signal indicative of a first fan speed from the at least one fan;

receiving a second signal indicative of a system temperature from the temperature sensor;

selecting a temperature setpoint based on the first fan speed; and

computing a first fan speed output based on a comparison of the system temperature and the selected temperature setpoint.

7. The system of claim 6, wherein the microcontroller is further for selecting a temperature setpoint based on a predetermined speed-setpoint droop characteristic.

8. The system of claim 7, wherein the predetermined speed-setpoint droop characteristic is stored in a memory associated with the microcontroller.

9. The system of claim 8, wherein the microcontroller is further for:
receiving via an external bus a third signal having a voltage value associated therewith,
the voltage value indicative of a highest requested fan speed; and
computing a second fan speed output based on the third signal.

10. The system of claim 9, wherein the microcontroller is further for:
receiving a fourth signal indicative of a manual speed;
computing a third fan speed output based on the manual speed.

11. The system of claim 10, wherein the microcontroller is further for generating a speed demand signal based upon one of the first speed output, the second fan speed output, and the third fan speed output.

12. The system of claim 11, wherein the speed demand signal is a PWM signal having a period and a duty cycle associated therewith.

13. The system of claim 12, wherein the microcontroller is further for calculating a voltage value based upon the duty cycle of the speed request signal.

14. The system of claim 13, further comprising:

a PWM fan drive for receiving the speed demand signal and generating a power output signal in response thereto, wherein the power output signal is transmitted to the at least one fan;

a PWM filter for generating a scaled filtered speed demand signal, the PWM filter including a diode gate circuit for gating the scaled filtered speed demand signal onto the external bus.